US006443725B1

(12) **United States Patent**
Kim

(10) **Patent No.: US 6,443,725 B1**
(45) **Date of Patent: *Sep. 3, 2002**

(54) **APPARATUS FOR GENERATING ENERGY USING CYCLIC COMBUSTION OF BROWN GAS**

(76) Inventor: **Sang Nam Kim**, Hyundai Apt. 202-104, 23-3 Chungdam-2dong, Kangnam-ku, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **09/533,067**

(22) Filed: **Mar. 22, 2000**

(30) **Foreign Application Priority Data**

Sep. 4, 1999 (KR) 99-37519

(51) **Int. Cl.**[7] **F23C 6/04**; F23C 11/00; F23D 14/16; F24C 15/24; A61H 33/06

(52) **U.S. Cl.** .... **431/2**; 431/7; 126/85 R; 126/91 R; 126/92 AC

(58) **Field of Search** .... 431/5, 170, 1, 431/171, 202, 326, 4, 7, 2; 126/8, 91 R, 92 R, 85 R, 92 C, 92 AC; 204/266, 270, 271, 278

(56) **References Cited**

U.S. PATENT DOCUMENTS

558,176 A	*	4/1896	Huber	126/92 R
951,060 A	*	3/1910	Vanden Driessche	126/85 R
978,127 A	*	12/1910	Brock	
1,053,695 A	*	2/1913	Ash	
1,218,206 A	*	3/1917	Panasevich	126/85 R
1,362,789 A	*	12/1920	Hamilton	126/92 C
1,414,360 A	*	5/1922	Hicks	122/155.2
1,494,499 A	*	5/1924	O'Dowd	126/92 C
1,502,200 A	*	7/1924	Howlett et al.	126/92 C
1,784,927 A	*	12/1930	Coon	431/170
1,970,529 A	*	8/1934	Walton	431/170
1,978,517 A	*	10/1934	Wetherbee	431/170
2,093,239 A	*	9/1937	Furlong	431/170
2,098,629 A	*	11/1937	Knowlton	
3,262,872 A	*	7/1966	Rhodes et al.	
4,081,656 A	*	3/1978	Brown	431/11
4,465,455 A	*	8/1984	Meyer	431/78
4,828,481 A	*	5/1989	Weil et al.	431/7
5,244,558 A	*	9/1993	Chiang	204/241
5,279,260 A	*	1/1994	Munady	

FOREIGN PATENT DOCUMENTS

DE	3838142	*	5/1990	431/2
EP	0101761	*	3/1984	431/2
JP	2000-329358	*	11/2000	126/91 R
JP	200174216	*	3/2001	
WO	WO-92/03686	*	3/1992	431/2

* cited by examiner

Primary Examiner—Carl D. Price

(57) **ABSTRACT**

An energy generating apparatus using the cyclic combustion of Brown gas is disclosed. The apparatus comprises a heat generating unit, an outer wall, a Brown gas generator, an open-shut valve and a burner. The heat generating unit is positioned on a base. The outer wall surrounds the heat generating unit so as to define a combustion chamber, is provided with a discharge hole at its upper portion, and radiates infrared rays. The Brown gas generator is used to generate Brown gas. The open-shut valve is positioned between supply pipes so as to block the Brown gas discharged from the Brown gas generator. The burner is used to heat the heat generating unit by burning Brown gas supplied through the open-shut valve and the supply pipes.

2 Claims, 3 Drawing Sheets

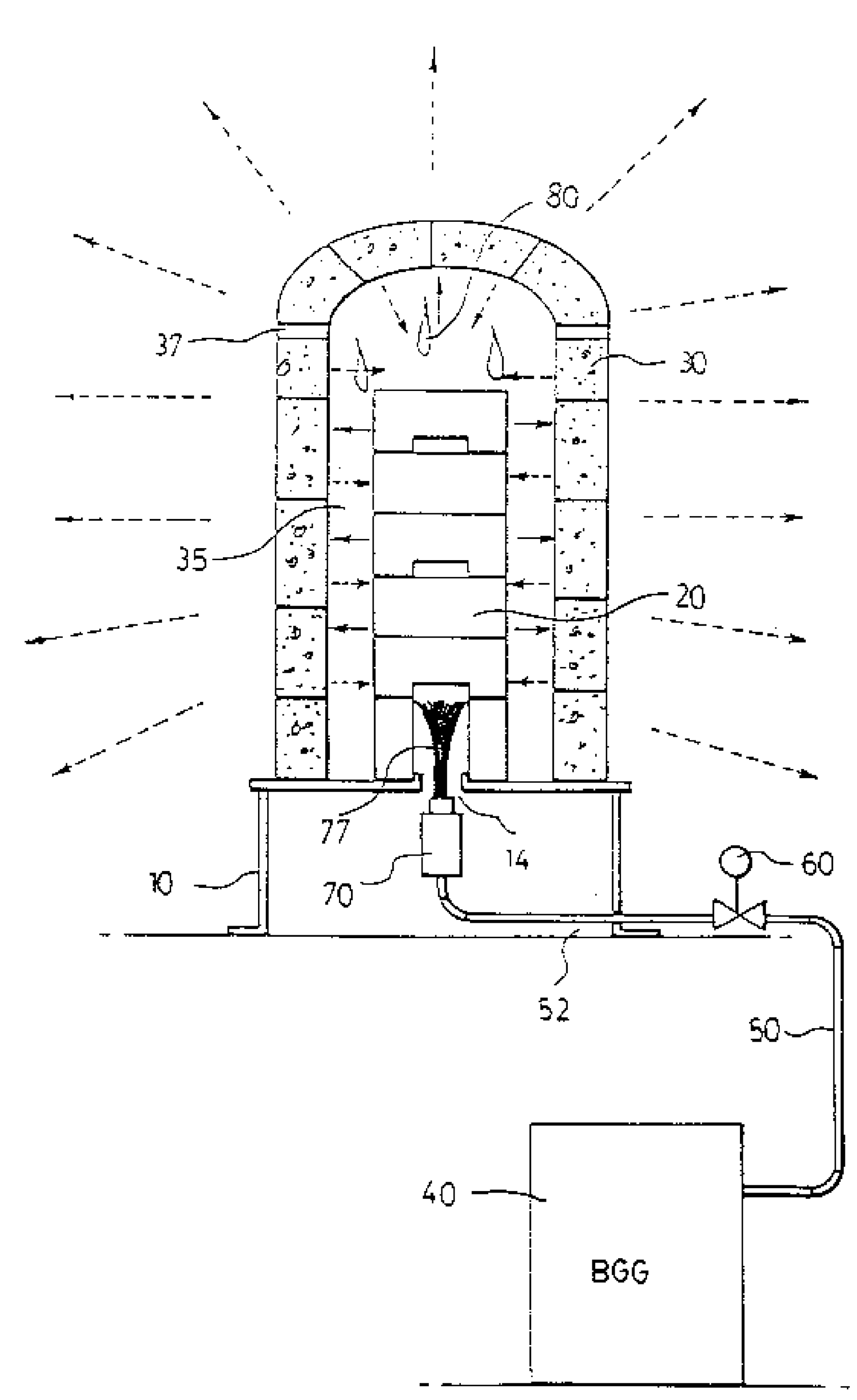


FIG.1

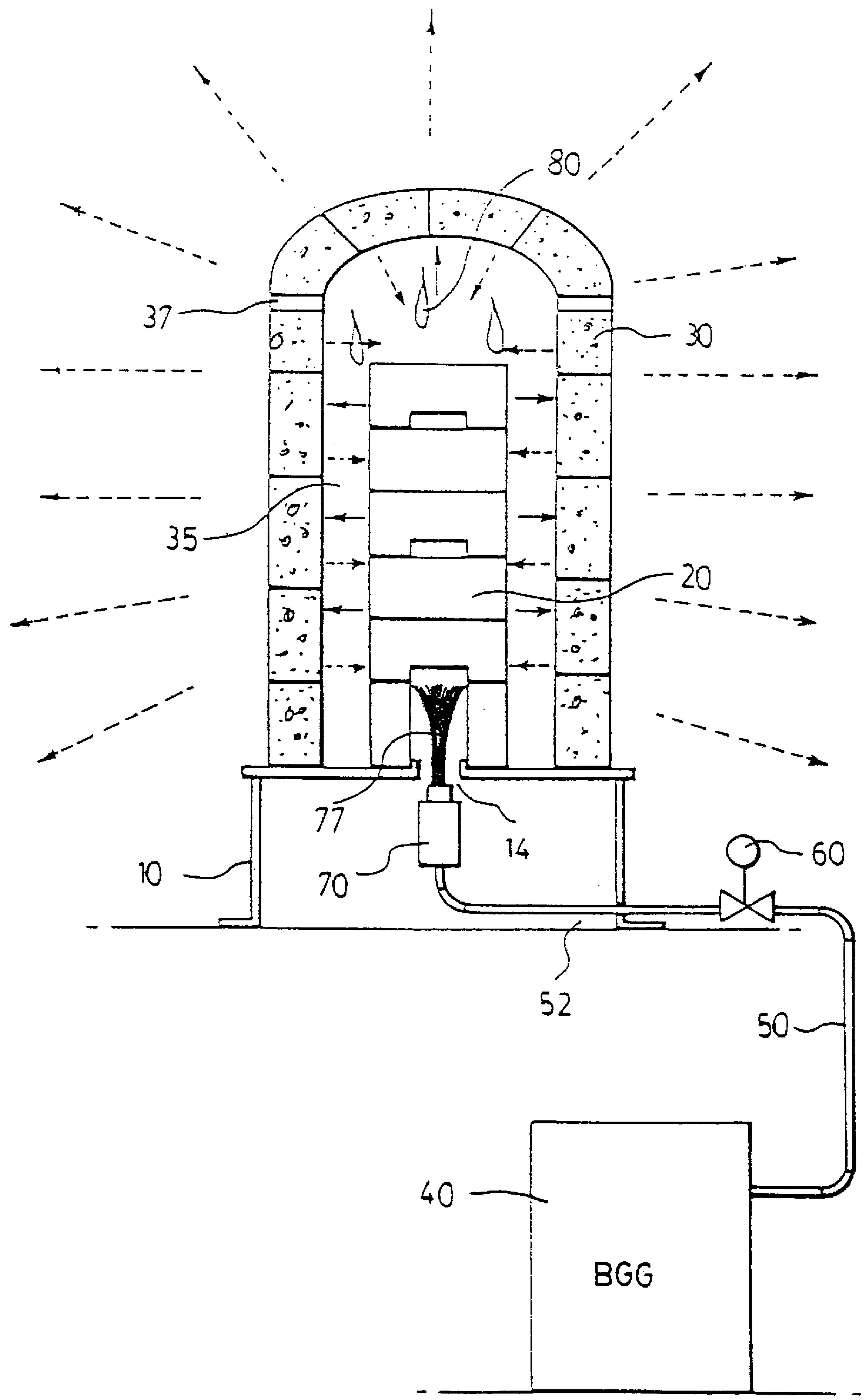


FIG.2

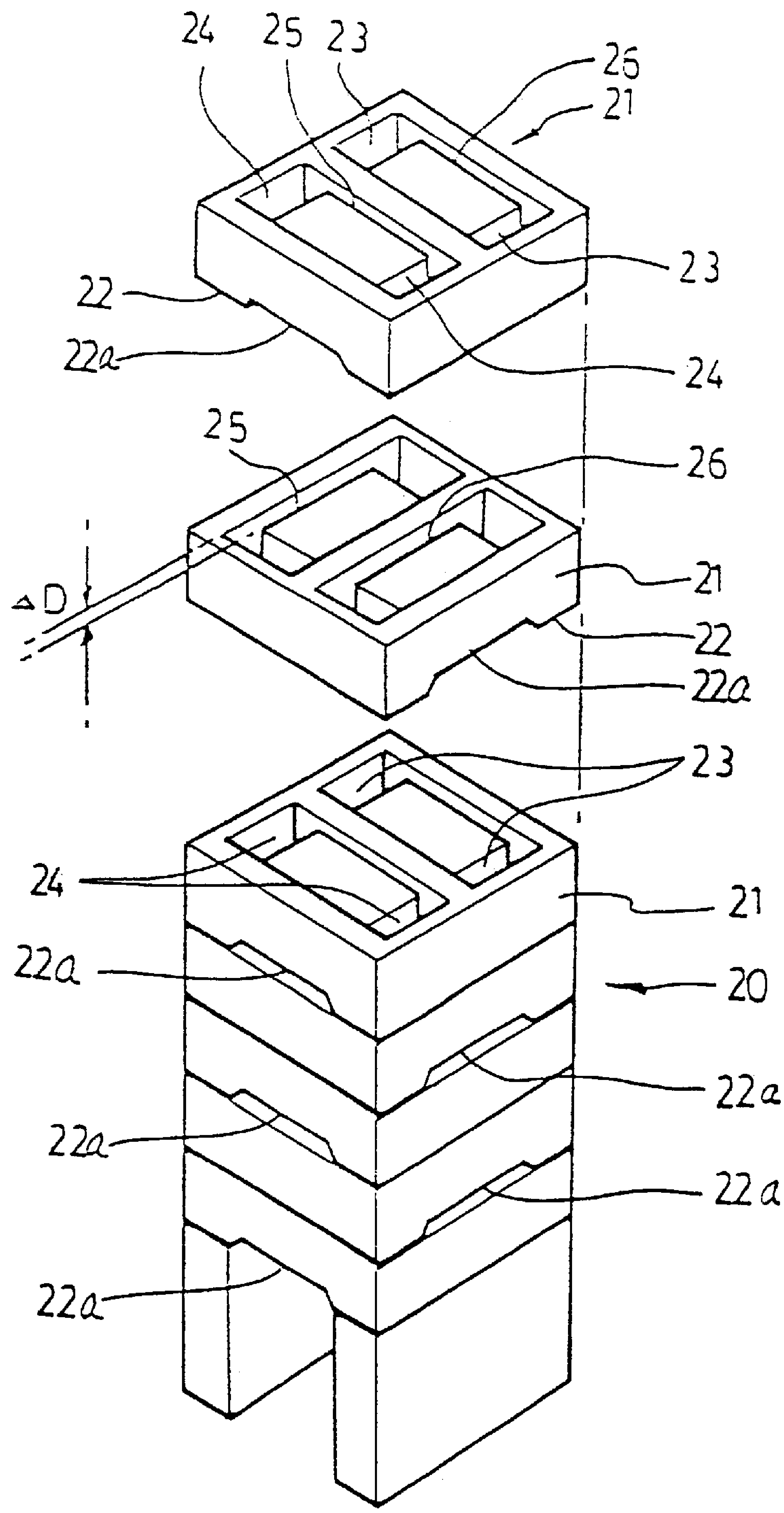
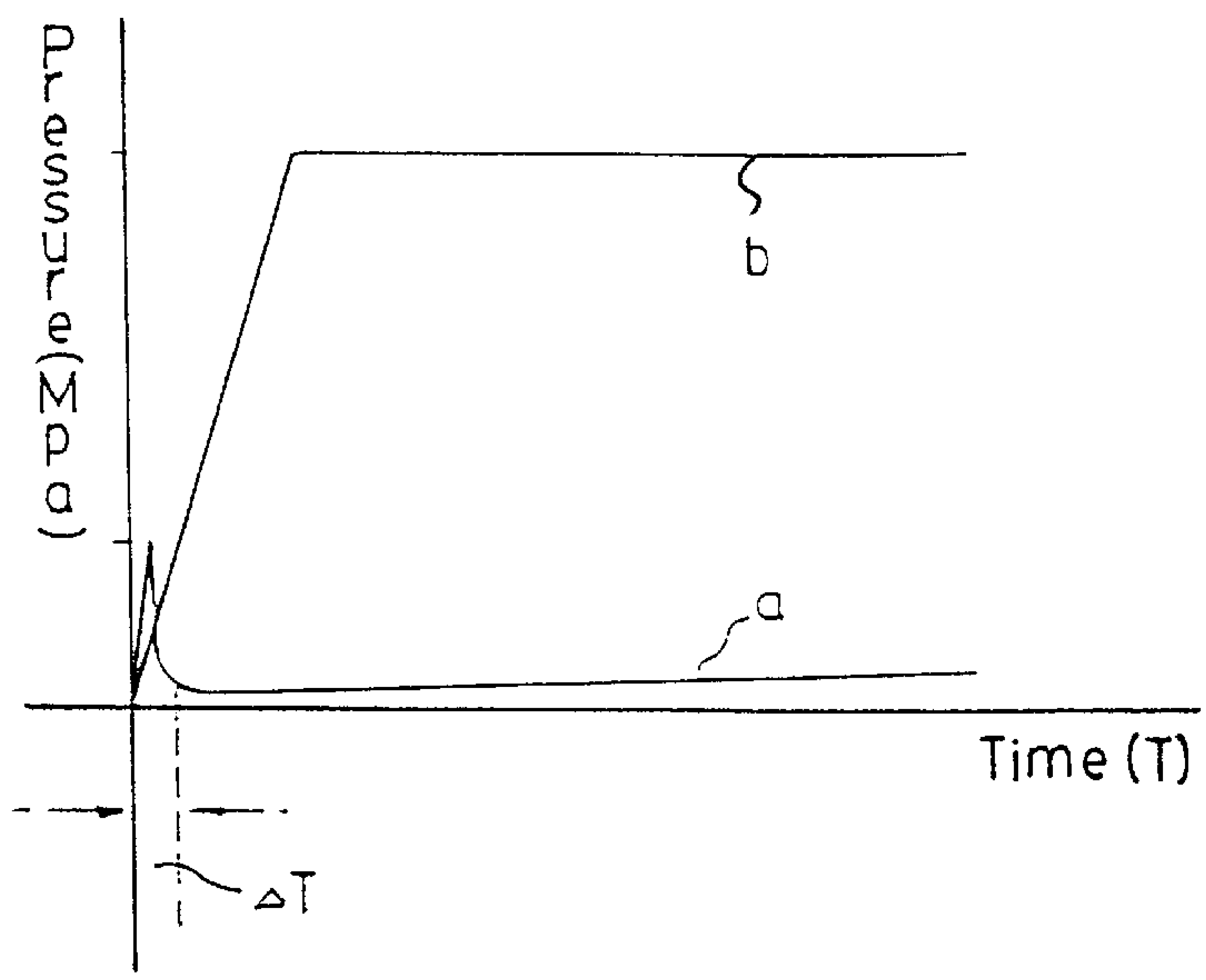
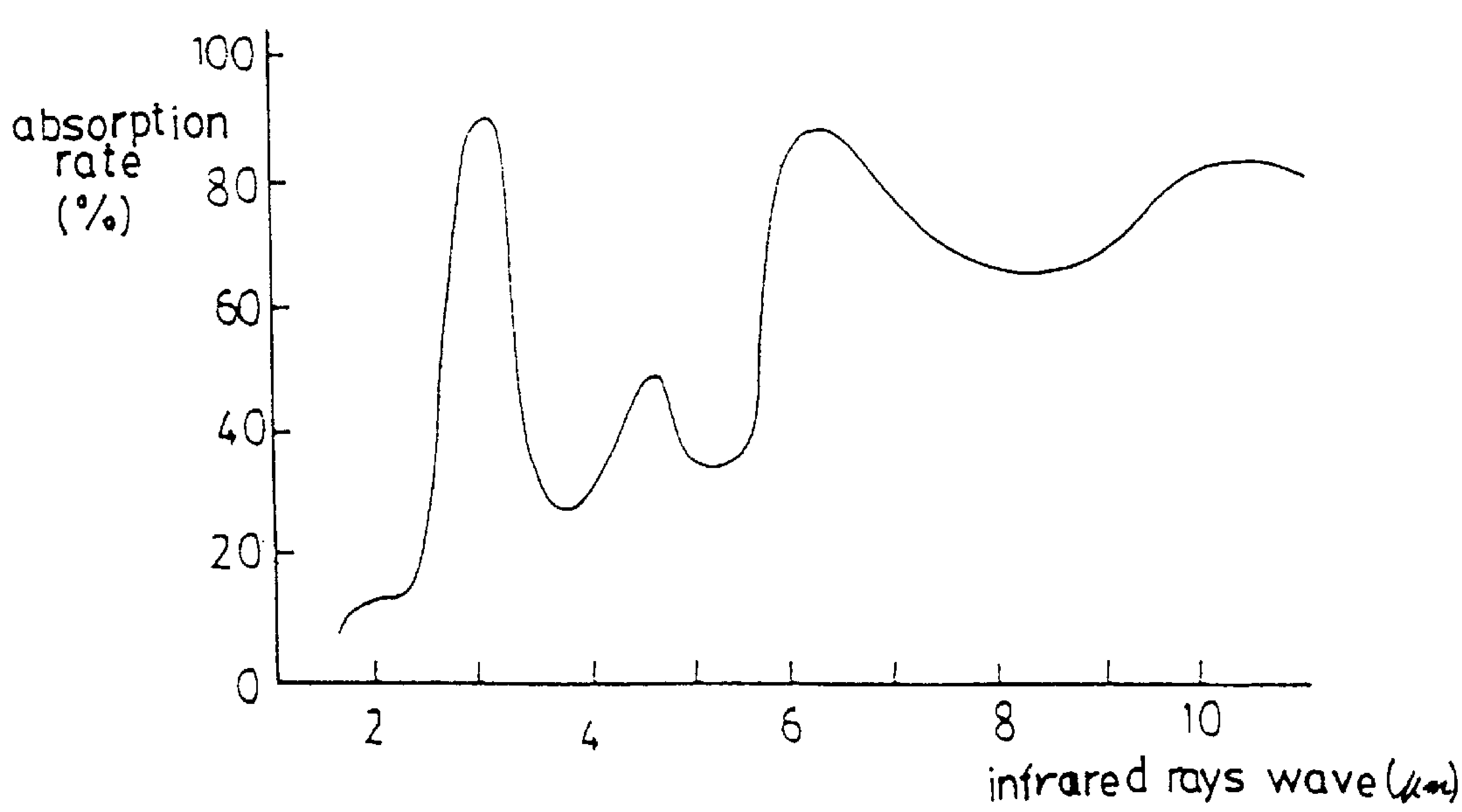

24
25
23
26
21
23
22
22a
24
25
26
21
22
22a
ΔD
23
24
21
22a
20
22a
22a
22a
22a

FIG.3



Pressure(Mpa)
b
a
Time (T)
ΔT

FIG.4



absorption rate (%)
100
80
60
40
20
0
2
4
6
8
10
infrared rays wave (μm)

APPARATUS FOR GENERATING ENERGY USING CYCLIC COMBUSTION OF BROWN GAS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates, in general, to energy generating apparatuses using the cyclic combustion of Brown gas and, more particularly, to an energy generating apparatus using the cyclic combustion of Brown gas, which generates a great quantity of energy by allowing Brown gas to repeat a cycle wherein the Brown gas supplied to a sealed combustion chamber is evaporated and transformed into water molecules after combustion, the water molecules absorb infrared rays and far infrared rays radiated from a heat generating unit and infrared radiating material and are ionized into hydrogen and oxygen while being heated to a high temperature due to a self-heat generating phenomenon, and, thereafter, the ionized hydrogen and oxygen is burnt.

2. Description of the Prior Art

Generally, in order to generate energy by burning fossil fuel, a great quantity of air must be supplied to a combustion chamber and a great quantity of exhaust gas is discharged to the atmosphere. The amount of lost energy contained in the exhaust gas is about 60% or more of the total generated energy.

In researches into the field of electrolysis, no great progress has been made since Michael Faraday established the theory of electrolysis in 1833. That is, the method of electrolysis was established and well known, but the method of electrolysis has not been applied to boilers, heaters, heating furnaces, etc. for commercial use.

The fact that the method of electrolysis has not been utilized in commercial applications results from theoretical and technological deficiency. The theoretical deficiency is that the implosion and thermal reaction characteristics of the Brown gas have not been known. The technological deficiency is that there occur problems including the leakage of water from a torch tip, etc. while the electrolytic bath is operated continuously because the development of an electrolytic bath is not sufficient.

SUMMARY OF THE INVENTION

Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide an energy generating apparatus using the cyclic combustion of Brown gas wherein a heat generating unit is heated to a temperature of 1,000° C. or more and an outer wall is heated by radiant heat radiated from the heat generating unit, so that infrared rays are radiated from the outer wall to the outside and inside.

Another object of the present invention is to provide an energy generating apparatus that generates a great quantity of energy by forcing Brown gas to repeat a cycle wherein the Brown gas supplied to the combustion chamber is evaporated and transformed into water molecules after combustion, the water molecules absorb infrared rays and far infrared rays radiated from the heat generating unit and infrared radiating material and are ionized into hydrogen and oxygen while being heated to a high temperature (1,000° C. →2,500° C. →4,000° C.) due to a self-heat generating phenomenon, and, thereafter, the ionized hydrogen and oxygen is burnt.

A further object of the present invention is to provide an energy generating apparatus that does not produce by-products, such as smoke, soot and odor.

Yet another object of the present invention is to provide an energy generation apparatus that does not need a chimney and an air supply.

In order to accomplish the above object, the present invention provides an energy generating apparatus using the cyclic combustion of Brown gas, comprising a heat generating unit positioned on a base, an outer wall surrounding the heat generating unit so as to define a combustion chamber, being provided with a discharge hole at its upper portion, and radiating infrared rays, a Brown gas generator for generating Brown gas, an open-shut valve positioned between supply pipes so as to block the Brown gas discharged from the Brown gas generator, and a burner for heating the heat generating unit by burning Brown gas supplied through the open-shut valve and the supply pipes.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a partial cross section showing an energy generating apparatus using the cyclic combustion of Brown gas according to an embodiment of the present invention;

FIG. **2** is a detailed perspective view showing the heat generating unit of the apparatus of FIG. **1**;

FIG. **3** is a graph showing the implosion characteristic of Brown gas; and

FIG. **4** is a graph showing infrared ray absorption ratios of water.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. **1** is a partial cross section showing an energy generating apparatus using the cyclic combustion of Brown gas according to an embodiment of the present invention. FIG. **2** is a detailed perspective view showing the heat generating unit of the apparatus of FIG. **1**.

As shown in FIGS. **1** and **2**, an energy generating apparatus using the cyclic combustion of Brown gas according to an embodiment of the present invention comprises a heat generating unit **20** positioned on a base **10**, an outer wall **30** surrounding the heat generating unit **20** so as to define a combustion chamber **35**, being provided with a vapor discharge hole **37** at its upper portion, and radiating infrared rays, a Brown gas generator **40** for generating Brown gas, an open-shut valve **60** positioned between supply pipes **50** and **52** so as to block the Brown gas discharged from the Brown gas generator **40**, and a burner **70** for heating the heat generating unit **20** by burning Brown gas supplied through the open-shut valve **60** and the supply pipes **50** and **52**.

As illustrated in FIG. **1**, the base **10** is made of iron members having a sufficient thickness and strength to sustain the heat generating unit **20** and the outer wall **30**. The base **10** is preferably configured to have an internal cavity. The base **10** is provided at its top with a mounting hole **14** for holding and fixing the nozzle (not shown) of the burner **70** and is provided at its sidewall with a door (not shown) for maintaining and repairing the burner **70**.

The heat generating unit **20** positioned on the base **10** is masoned by laying blocks **21** alternatively in regard to their directions, with each of the blocks **21** being made by calcining a block that is formed of high temperature ceramic (having a refractoriness of SK**37** or more) whose chief ingredient is Al_2O_3. As shown in FIG. **2** in detail, each of the blocks **21** is provided with a groove **22***a*, two pairs of through holes **23** and **24** and a pair of depressions **25** and **26**. The groove **22***a* is formed in the middle portion of the bottom of the block **21** so as to receive heat radiated from the flame **77** of the burner **20** and store the heat, the through holes **23** and **24** are formed through both sides of the groove **22***a* so as to transmit the stored heat upwards, and the depressions **25** and **26** are formed by depressing the top of the block **21** between two opposing through holes **23** or **24** by a depth of ΔD.

The infrared radiating material constituting the outer wall **30** should be a material that radiates a great quantity of infrared rays and is preferably elvan.

Hereinafter, the operation of an energy generating apparatus using the cyclic combustion of Brown gas is described.

The Brown gas in the present invention refers to a gas that is generated in the electrolytic structures of oxyhydrogen gas generators that are disclosed in Korea Utility Model Registration No. 117445, Korea Industrial Design Registration No. 193034, Korea Industrial Design Registration No. 193035, Korea Industrial Design Registration No. 19384266, Korea Industrial Design Registration No. 191184 and Japan Utility Model Registration No. 3037633.

The Brown gas is generated in the Brown gas generator **40**, is supplied to the burner **70** through the open-shut valve **60** positioned between the supply pipes **50** and **52**, and, subsequently, is spouted to the combustion chamber **35** through the nozzle of the burner **70**.

At this time, if the Brown gas spouted from the nozzle of the burner **70** is ignited, the bottom block **21** of the heat generating unit **20** is heated as the gas flame **77** is generated. As a consequence, heat is transferred to the upper blocks **21** of the heat generating unit **20** through the holes **23** and **24**, and so the heat generating unit **20** becomes red hot. Finally, the heat (whose directions are designated by the solid line arrows in FIG. **1**) radiated from the heat generating unit **20** renders the outer wall **30** to be heated.

Since heat accumulated in the combustion chamber **35** is greater in amount than lost heat, the combustion chamber may be maintained to be at a high temperature with a small fuel supply. In addition, since the heat generating unit mounted in the combustion chamber **35** is directly heated by the Brown gas, the entire heat generating unit **20** is heated to be at a high temperature of 1,000° C. or more as the heat generating unit **20** becomes red hot due to the thermal reaction of the Brown gas.

The infrared rays (whose directions are designated by the long dotted line arrows in FIG. **1**) radiated from the heated outer wall **30** to the outside may be used for the purpose of room heating because the outer wall **30** of the combustion chamber **35** is made of far infrared radiation material such as elvan and is sealed except for a vapor discharge hole **37**.

Additionally, each of the infrared rays (whose directions are designated by the short dotted line arrows in FIG. **1**) radiated from the outer wall **30** to the combustion chamber **35** is directed from a portion of the outer wall **20** to its opposing portion of the outer wall **20**, and so each portion of the outer wall **20** heats its opposing portion of the outer wall **20**, thereby heating the outer wall **20** to a high temperature. In addition, the heat generating unit **20** not only is heated by the combustion of the Brown gas but also is heated by the radiation of infrared rays from the outer wall **30**.

As a consequence, the entire heat generating unit **20** radiates infrared rays continuously while being red hot at a temperature of 1,000° C. or more and at the same time the outer wall **30** radiates infrared rays continuously while being heated by the indirect heat of the heat generating unit **20**, so that the temperature of the combustion chamber **35** is increased and is maintained high. As time passes, pillars of flames **80** are generated in the upper portion of the combustion chamber **35**, that is over the heat generating unit **20**. If the quantity of the Brown gas supply is not reduced, the exterior wall of the combustion chamber **35**, that is the outer wall **30** may be melted down.

The operation of the present invention is described in more detail in the following.

1. Four Chief Characteristics of Brown Gas

A. Pollution-free Characteristic

Since the Brown gas is generated from water and is restored to vapor after being burned, pollutants are not created.

B. Complete Combustion Characteristic

Since the Brown gas is a mixture gas of hydrogen and oxygen that has a chemical equivalent ratio of two to one, the Brown gas has oxygen sufficient for complete combustion.

C. Implosion Characteristic

The Brown gas generator **40** produces about 1,860 liters of Brown gas with 1 liter of water. On the contrary, as designated by curve "a" of FIG. **3**, when 1,860 liters of the Brown gas is burnt in a sealed pressure container, a pressure of 0.5 MPa is reached and immediately an abrupt pressure drop is experienced, during the explosion duration ΔT of $44/1{,}000{,}000$ second. In addition, as soon as the pressure drop is experienced, implosion occurs and at the same time the volume reduction of $1/1{,}860$ is generated. That is, 1 liter of water is generated and the rest of the volume is vacuumized. The phenomenon may be referred to as implosion that is different from explosion. In FIG. **3**, curve "b" is an explosion curve that is plotted when a normal gas is exploded in a pressure container, and is different from the curve "a".

The gas flame **77** occurring in the combustion of the Brown gas is generated by the continuation of implosions. The gas flame **77** progresses straight without interruption and forms a pinpoint flame. The length of the gas flame **77** may reach 400 mm.

D. Thermal Reaction Characteristic

The Brown gas is a mixture gas that includes atomic hydrogen and oxygen dissociated from water. In the gas flame **77** generated during the combustion of the Brown gas, the atomic and molecular hydrogen and oxygen reacts. The atoms of hydrogen and oxygen infiltrate into the atomic nucleus of heated material. The material that is heated by the thermal reaction of hydrogen and oxygen is heated by the gas flame **77** hotter than flame generated during the combustion of gas in the atmosphere. The Brown gas melts aluminum at 700° C. and evaporates tungsten while generating 6,000° C. of heat. The Brown gas that shows various thermal reactions according to heated materials can weld the blocks **21** to iron while melting the blocks **21** and the iron.

2. Combustion and Heat Generating Mechanism of Brown Gas

The combustion process of the molecular hydrogen and oxygen is as follows:

$H_2 \rightarrow H.+H.$

$O_2 \rightarrow O:+O:$

$H+O_2 \rightarrow O:+OH.$

$O:+H_2 \rightarrow H.+OH.$

$O:+H_2O \rightarrow OH.+OH.$

$OH.+OH. \rightarrow H_2O+O:$

When the electron of OH. is excited and is returned to its original state, heat is generated. Additionally, energy generated when atoms are transformed into molecules may be utilized.

3. Self-heat Generation Phenomenon by Infrared Rays

FIG. **4** is a graph showing infrared ray absorption ratios of water. The graph shows that the absorption ratio peaks at 3 μm of a middle-infrared wavelength range and the absorption ratios are high at 6–11 μm of far infrared wavelength range. In other words, if a molecule of water comes into contact with an infrared ray of 3 μm of a wavelength, the molecule absorbs almost 100% of the infrared ray. At this time, the molecule of water radiates a great quantity of energy as heat while the molecule of water is excited and the collisions of molecules of water become severe.

The energy generating apparatus of the present invention generates a great quantity of energy in the process of allowing the Brown gas to repeat a cycle wherein the water molecules generated continuously during combustion absorb infrared rays and far infrared rays and are ionized into hydrogen and oxygen while being heated to a high temperature due to a self-heat generating phenomenon and the ionized hydrogen and oxygen is burnt.

4. Function of Seal-type Combustion Chamber

In the energy generating apparatus using the cyclic combustion of Brown gas according to the present invention, the four chief characteristics of the Brown gas appear. In the apparatus, smoke and soot are not produced because carbon does not exist in the Brown gas, and the combustion in a sealed space in which an air inlet and a chimney are not needed is possible because complete combustion can be performed.

Therefore, since heat accumulated in the combustion chamber **35** is greater in amount than lost heat, the combustion chamber may be maintained to be at a high temperature with a small fuel supply.

In addition, since the heat generating unit mounted in the combustion chamber **35** is directly heated by the Brown gas, the heat generating unit **20** radiates heat as the heat generating unit **20** becomes red hot due to the thermal reaction characteristics of the Brown gas and the entire heat generating unit **20** is heated to be at a high temperature of 1,000° C. or more.

Since the outer wall **30** of the combustion chamber **35** is made of far infrared radiation material such as elvan and is sealed except for the vapor discharge hole **37**, the infrared rays (whose directions are designated by the long dotted line arrows in FIG. **1**) radiated from the heated outer wall **30** to the outside may be used for the purpose of room heating.

Additionally, each of the infrared rays (whose directions are designated by the short dotted line arrows in FIG. **1**) radiated from the outer wall **30** to the combustion chamber **35** is directed from a portion of the outer wall **20** to its opposing portion of the outer wall **20**, and so each portion of the outer wall **20** heats its opposing portion of the outer wall **20**, thereby heating the outer wall **20** to a high temperature. In addition, the heat generating unit **20** not only is heated by the combustion of the Brown gas but also is heated by the radiation of infrared rays from the outer wall **30**.

As a consequence, the entire heat generating unit **20** radiates infrared rays continuously while being red hot at a temperature of 1,000° C. or more and at the same time the outer wall **30** radiates infrared rays continuously while being heated by the indirect heat of the heat generating unit **20**, so that the temperature of the combustion chamber **35** is increased and is maintained high. As time passes, pillars of flames **80** are generated in the upper portion of the combustion chamber **35**, that is over the heat generating unit **20**. The pillars of flames **80** prove that the vapor generated by the combustion of the Brown gas is burned cyclically.

The present invention generates energy at a high efficiency in the combustion chamber that has a sealed structure in which the interior temperature of the structure can be maintained at a high temperature with a small quantity of fuel, using as fuel the Brown gas having the above-described characteristics.

According to the present invention, the heat generating unit **20** is heated to a temperature of 1,000° C. or more by burning the Brown gas, and infrared rays are radiated from the outer wall **30** to the outside and inside by heating the outer wall **30** by means of radiant heat radiated from the heat generating unit **20**. In addition, the Brown gas repeats a cycle wherein the Brown gas supplied to the combustion chamber **35** is evaporated and transformed into water molecules after combustion and the water molecules absorb infrared rays and far infrared rays radiated from the heat generating unit **20** and the infrared radiating material and are ionized into hydrogen and oxygen while being heated to a high temperature due to a self-heat generating phenomenon. In the process of repeating the cycle, since a great quantity of heat is generated by the cyclic combustion of the vapor and the Brown gas is burnt, air supply for the combustion and the chimney for discharging the by-products of the combustion are not needed.

According to the present invention, water can be used as fuel for commercial use because there is developed an electrolytic bath that generates the Brown gas stably, and the high barrier of an electrolytic technology can be broken down because the characteristics of the Brown gas are found and applied.

In addition, according to the present invention, there is provided the combustion chamber that does not need the air inlet and the chimney, using the characteristics of the Brown gas, thereby bringing about a combustion revolution. The energy generating apparatus can generate a great quantity of energy during the repetition of the cycle wherein the water molecules absorb infrared rays radiated from the infrared ray radiating material to the inside and are ionized into hydrogen and oxygen while being heated to a high temperature due to a self-heat generating phenomenon.

The present invention provides a new combustion technique that has not been fabricated by prior arts, thereby bringing about a combustion revolution. Since the heat generating apparatus of the present invention can achieve high temperature, the apparatus may be used as a combustion apparatus that should achieve high temperature.

For example, when a water conduit is positioned in the energy generating apparatus of the present invention and water is circulated through the water conduit, this construction may be used as a boiler. The energy generating apparatus may be used as a special waste disposal furnace that should reach 2,000° C.

Since the outside of the energy generating apparatus is formed of infrared radiating material such as elvan, a great quantity of far infrared rays of a wavelength range (6–14 μm) profitable to the human body is radiated when the heated temperature of the infrared generating material is maintained at 300–400° C. Therefore, the apparatus may be used for far infrared room heating for green houses, chicken raising houses and cattle sheds.

The inventor of the present invention has commercialized an elvan heating furnace that is an application of the energy generating apparatuses of the present invention. In the furnace, everybody can observe with an unaided eye a surprising phenomenon where the pillars of fire are generated while water is burnt.

The present invention may be applied to the elvan heating furnace that radiates far infrared rays of a wavelength range (6–14 μm) profitable to the human body, thereby improving human health by means of its heat effects. The present invention generates clean energy without pollution at a high efficiency, thereby realizing the dream of energy generation without pollution.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

What is claimed is:

1. An energy generating apparatus using the cyclic combustion of Brown gas, comprising:

a heat generating unit positioned on a base, wherein said heat generating unit is masoned by stacking blocks adjacently perpendicular lengthwise, with each of the blocks being made by calcining a block of high temperature ceramic whose chief ingredient is Al_2O_3, in which each of the blocks is provided with a groove formed in a middle portion of a bottom of the block so as to improve the block's capacity to receive and store heat, two pairs of through holes formed through both sides of the groove so as to transmit the stored heat upwards, and a pair of depressions formed by depressing a top of the block between the two pairs of opposing through holes;

an outer wall surrounding the heat generating unit so as to define a combustion chamber, heated by the heat generating unit and radiating infrared rays and far infrared rays which have a combined wavelength comprising a range that is absorbed by water;

a Brown gas generator generating Brown gas; and

a burner heating the heat generating unit by burning Brown gas supplied from the Brown gas generator.

2. An energy generating apparatus using the cyclic combustion of Brown gas, comprising:

a heat generating unit masoned by stacking blocks adjacently perpendicular lengthwise, with each of the blocks being made by calcining a block of high temperature ceramic whose chief ingredient is Al_2O_3, and being provided with a groove formed in a middle portion of a bottom of the block so as to improve the block's capacity to receive and store heat, two pairs of through holes formed through both sides of the groove so as to transmit the stored heat upwards, and a pair of depressions formed by depressing a top of the block between the two pairs of opposing through holes;

an outer wall surrounding the heat generating unit so as to define a combustion chamber, heated by the heating unit, and radiating infrared rays;

a Brown gas generator generating Brown gas; and

a burner heating the heat generating unit by burning Brown gas supplied from the Brown gas generator.

* * * * *